

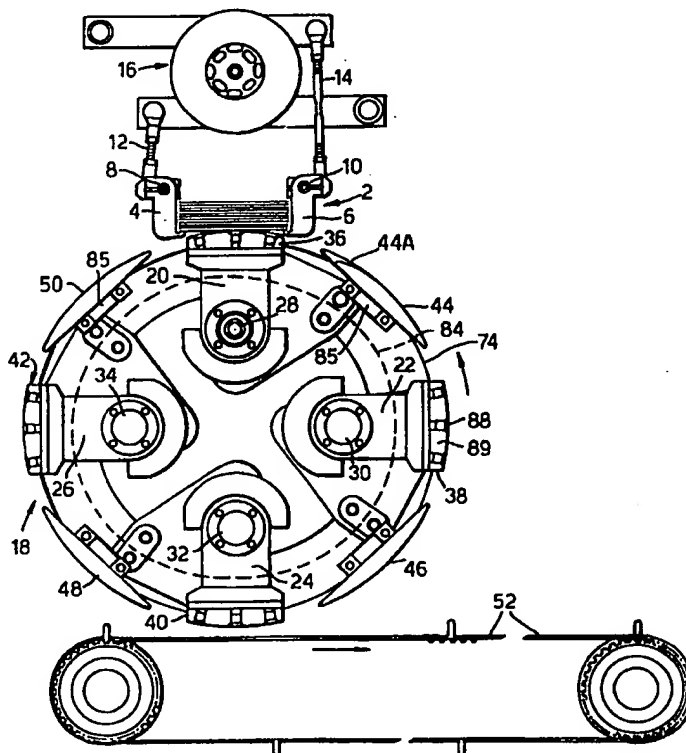


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>B65H 3/00</b>	<b>A2</b>	<b>(11) International Publication Number:</b> <b>WO 98/42604</b> <b>(43) International Publication Date:</b> 1 October 1998 (01.10.98)
<b>(21) International Application Number:</b> PCT/GB98/00932 <b>(22) International Filing Date:</b> 26 March 1998 (26.03.98)  <b>(30) Priority Data:</b> 9706261.6                      26 March 1997 (26.03.97)                      GB  <b>(71) Applicant (for all designated States except US):</b> MOLINS PLC [GB/GB]; 11 Tanners Drive, Blakelands, Milton Keynes MK14 5LU (GB).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> BAILEY, Thomas, William [GB/GB]; 13 Westwood Way, Westwood Business Park, Coventry CV4 8HS (GB). CLEALL, Andrew, John [GB/GB]; 13 Westwood Way, Westwood Business Park, Coventry CV4 8HS (GB). HILL, Brian [GB/GB]; 13 Westwood Way, Westwood Business Park, Coventry CV4 8HS (GB).  <b>(74) Agent:</b> WEBB, John, Charles; Molins plc, Group Patent Dept., Haw Lane, Saunderton, High Wycombe, Bucks HP14 4JE (GB).		<b>(81) Designated States:</b> CN, JP, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>Without international search report and to be republished          upon receipt of that report.</i>

**(54) Title:** BLANK HANDLING APPARATUS**(57) Abstract**

Blank feeding apparatus, particularly in a hinged-lid cigarette packing machine, includes rotary blank pick-up means (36-42), and support means (44-50), rotatable with the pick-up means, for engaging and supporting the base of a blank stack in a magazine (2) between each pick-up operation. The pick-up means (36-42) may each comprise a pivotable arm (20-24), movable as it rotates by means of a pivoted follower member (60, 62) engaging a fixed cam track (54). The blanks may be retained in the stack in the magazine (2) by pivotally-mounted support fingers (4, 6) which are successively retracted to release a blank as the pick-up means (36-42) passes.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakhstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

## Blank Handling Apparatus

This invention relates to apparatus for handling blanks or other sheets, and particularly to apparatus for separating and conveying sheet-like blanks stored in a stack.

Various types of prior art blank feeding apparatus are known, in which blanks can be picked from a stack before being passed to a carton forming apparatus (for example). Generally, it is convenient to pick the blanks from the bottom of the stack, so that the magazine or feed box containing the stack of blanks can be easily filled from the top.

One aspect of the present invention provides apparatus for handling blanks comprising a magazine for receiving a stack of blanks and including means for supporting the stack, endless conveyor means for receiving successive lowermost blanks from the stack, said conveyor means including at least one blank pick-up device arranged to receive and convey blanks from the stack, and support means carried by the endless conveyor means for at least partly supporting the stack between pick-up operations of said pick-up device.

In a preferred arrangement the endless conveyor means is driven continuously, and may carry a plurality of spaced pick-up devices between which are arranged a plurality of spaced support members. The endless conveyor means may comprise a rotary member rotatable about an axis which is parallel to a plane in which the lowermost blank of the stack extends. Each pick-up device may include an arm pivotted about an axis parallel to this axis and control means may be provided for controlling the angular position of the arm as the rotary member rotates about the axis. In this way, the arm may be arranged to reciprocate about its pivot axis so that a peripheral arcuate surface for receiving a blank performs a rolling action relative to the stack so as to receive a lowermost blank.

The support members may include arcuate surfaces at least approximately coaxial with the axis of said rotary member and arranged to engage successive lowermost blanks in the stack. The support members and pick-up devices may be so disposed as to allow a support member to engage the stack during a pick-up operation, i.e. as a blank is being withdrawn by a pick-up device the next blank is already being supported by the following support member.

A further aspect of the invention provides apparatus for handling

1 blanks comprising a magazine for receiving a stack of blanks and  
2 including means for supporting the stack, endless conveyor means for  
3 receiving successive lowermost blanks from the stack, said conveyor  
4 means including at least one blank pick-up device arranged to receive  
5 and convey blanks from the stack, wherein said endless conveyor  
6 means comprises a rotary member rotatable about an axis and said  
7 pick-up device includes an arm pivoted about an axis parallel to said  
8 axis, and control means for controlling the angular position of the arm as  
9 said rotary member rotates about said axis.

10 Preferably each arm is arranged to reciprocate about its pivot  
11 axis, e.g. so as to pivot in the region of the magazine from a forward  
12 position to a rearward position, thereby providing a rolling action against  
13 the base of the stack. This pivotal motion of each arm may be achieved  
14 by a cam and follower arrangement, although it may also be achieved,  
15 for example, by suitable crank operated drive linkages. In a preferred  
16 arrangement a pivotable follower means is engaged with a fixed cam  
17 track: the follower means may be independently pivoted to the arm.

18 A still further aspect of the invention provides apparatus for  
19 handling blanks comprising a magazine for receiving a stack of blanks  
20 and including means for supporting the stack, endless conveyor means  
21 for receiving successive lowermost blanks from the stack, said conveyor  
22 means including at least one blank pick-up device arranged to receive  
23 and convey blanks from the stack, said supporting means including  
24 means for supporting opposed edges of the lowermost blank of the  
25 stack including retractable elements respectively at the leading and  
26 trailing edges of a lowermost blank, and means for sequentially  
27 retracting said elements in synchronism with movement of the pick-up  
28 device to receive said lowermost blank.

29 The supports for the opposed edges of the stack may comprise  
30 respective pivotally mounted support fingers at the leading and trailing  
31 edges of the lowermost blank, which are arranged to be successively  
32 retracted, as the blank is removed from the bottom of the stack, by a  
33 further cam drive mechanism.

34 One embodiment of the invention will now be described by way of  
35 example only, with reference to the accompanying diagrammatic  
36 drawings, in which:

37 Figure 1 is a schematic elevational view of a blank handling  
38 apparatus;

1           Figure 2 is a perspective view of a pick-up arm assembly and an  
2 associated cam track in the apparatus of Figure 1;

3           Figure 3 is an elevational view showing the relative position of the  
4 cam track of Figure 2 in the apparatus of Figure 1;

5           Figure 4 is a part-sectional side elevation of a drive mechanism of  
6 the apparatus of Figure 1;

7           Figure 5 is a perspective view of a blank support mechanism in  
8 the apparatus of Figure 1;

9           Figure 6 is a transverse sectional view of a blank magazine of the  
10 apparatus of Figure 1; and

11           Figures 7A to 7G respectively illustrate successive rotational  
12 positions of a blank feed mechanism in the apparatus of Figure 1.

13           Referring to Figure 1, which illustrates the overall layout of the  
14 apparatus, a magazine 2 containing a stack of blanks 3, e.g. card blanks  
15 for hinged lid cigarette packets, includes pairs of stack support fingers 4  
16 and 6, which are pivotally mounted at 8 and 10 respectively on a cam  
17 driven mechanism which enables them to be retracted outwardly away  
18 from the stack, when required, as explained in more detail below.  
19 Respective links 12 and 14 are arranged to move the fingers 4, 6, in  
20 synchronism with the rest of the apparatus, via a cam drive mechanism  
21 indicated generally at 16.

22           A rotatable drum assembly 18 supports four pivotally mounted  
23 pick-up arms, indicated respectively at 20, 22, 24 and 26, between  
24 axially-spaced inner and outer drum plates 74 and 84 (see also Figure  
25 4). The arms are pivotally mounted on the plate 84 by means of journals  
26 28, 30, 32 and 34 respectively, and carry at their outer ends respective  
27 suction pick-up heads 36, 38, 40 and 42. At each intermediate position  
28 of the drum assembly 18, between the pairs of pick-up heads, an outer  
29 guide or support member 44, 46, 48 or 50 is fixed to the drum assembly  
30 18 so as to support the stack when it is not engaged by one of the  
31 pick-up heads.

32           Finally, beneath the drum assembly 18, a discharge conveyor 52  
33 is arranged to receive blanks from the pick-up heads, in order to  
34 transport them to the next stage of the assembly operation.

35           As shown in Figures 2-4, the motion of the pick-up arms is  
36 controlled by means of a fixed cam track 54, comprising a groove in a  
37 fixed pad 56, in which a generally triangular slotted link 58 is guided, by  
38 means of a pair of cam followers 60 and 62 engaging on opposite sides

1 of the track.

2 The radially outward corner of the triangular link 58, relative to the  
3 pivotal axis 30 of the pick-up arm 22, is also pivotally connected to the  
4 drum assembly 18 at 64, and thus, as the assembly rotates, the link 58 is  
5 caused to oscillate about the pivot 64 by engagement of the cam  
6 followers 60 and 62 with the track 54. Consequently, the radially  
7 innermost corner 66 of the link 58 oscillates about the pivot 64, with the  
8 rotation of the drum assembly 18, and this corner carries an elongate  
9 slot 67 in which is engaged a pin 68 connected to a lever 70. The lever  
10 70 is fixed to one end of a shaft 72 which carries the pick-up arm 22.  
11 Consequently, the oscillation of the inner corner 66 of the triangular link  
12 58 is translated by the link 70, via the follower pin 68, to provide a wiping  
13 movement for the pick-up arm 22, as explained in more detail below. It  
14 will be understood that the other pick-up arms 20, 24 and 26 are  
15 mounted on the drum assembly 18 in the same way as the pick-up arm  
16 22.

17 The motion of the pick-up arms 20 etc may be controlled by other  
18 cam and link mechanisms than that shown in the drawings, or by a  
19 series of gear wheels.

20 Figure 4 illustrates the general arrangement of the mechanism  
21 shown in Figures 2 and 3 in side elevation, and it will be seen that the  
22 inner end of shaft 72 is journaled at 76 in the rotatable inner drum plate  
23 74. The pivot 64 of the slotted link 58 is also journaled in the drum plate  
24 74. Drive is transferred to the inner drum plate 74 by means of an outer  
25 casing 78 which is in turn rotated by a main drive pulley 80. A secondary  
26 drive pulley 82 drives the stack support finger mechanism, as described  
27 in more detail below.

28 The outer drum plate 84, which supports the other end of the  
29 pick-up arm shaft 72 by means of the journal 30, is connected to the  
30 inner plate 74 by four fixed struts 85 which respectively carry the support  
31 members 44, 46, 48, 50, which each comprise axially spaced elements,  
32 as seen in Figure 4. The drum assembly 18, including the plates 74 and  
33 84, is rotatably supported on a fixed shaft 87. The outer surface of the  
34 outer drum plate 84 is in sliding contact, by way of a carbon ring 91, with  
35 a fixed frame member 93 which contains an arcuate suction manifold 95  
36 communicating with its face adjacent the drum plate 84. Adjacent each  
37 shaft 72 the plate 84 is provided with a port 86 communicating with  
38 passages in the shaft and pick-up arm, so as to provide vacuum to a

1 plurality of suction pads 88 carried on the pick-up head 38 at suitable  
2 points in the rotation of the drum assembly 18, corresponding to  
3 positions where the port 86 is adjacent the manifold 95. For convenience  
4 of indicating its arcuate extent relative to the axis of the drum assembly  
5 18 only, the shape of the manifold 95 is indicated in Figure 3, from which  
6 it will be noted that the manifold is in two arcuate sections extending  
7 from the region of the magazine 2 to the region of the conveyor 52  
8 (Figure 1). The suction pads 88 are arranged in circumferential rows  
9 separated by blank support guides 89 which have arcuate edges. Each  
10 pick-up arm 22 could have a part-cylindrical peripheral surface provided  
11 with a series of suction openings which draw a blank against the surface,  
12 instead of the arrangement of suction pads 88 and guides 89.

13 Figure 5 illustrates the operation of the stack support fingers 4, 6  
14 of the magazine, the mechanism being driven by a pulley 92 by way of a  
15 belt (not shown) passing also around the secondary drive pulley 82 of  
16 the drum assembly 18 (Figure 4).

17 The pulley 92 drives a disc 94, whose rear surface (as seen in  
18 Figures 3 and 5) carries a cam track which is engaged by a follower 96  
19 fixed to an actuating arm 100. Similarly, another disc 97 carries a cam  
20 track which is engaged by a follower 98 fixed to an actuating arm 102.

21 The outer ends 104, 106 of the arms 100, 102 are pivoted to fixed  
22 points on the apparatus, so that the rotation of the cam discs 94, 97  
23 causes their opposite ends 108, 110, to rise and fall in a predetermined  
24 pattern, actuating the links 12 and 14 whose upper ends are in turn  
25 pivoted to the ends 108, 110. This transfers movement to the leading  
26 and trailing sets of support fingers 4 and 6, so as to release the  
27 corresponding edges of the blanks 3 in the stack in the required  
28 sequence.

29 Referring particularly to Figure 6, there are three pairs of stack  
30 support fingers 4, 6 at the base of the magazine 2. In addition, the  
31 magazine 2 has a number of vertically-extending guide rods 112 placed  
32 so as to assist in location of the stack of blanks 3 in the magazine.  
33 Further vertically-extending guides 114, 116, having engagement faces  
34 adapted to the shape of the blanks 3, are provided to further aid precise  
35 location and prevent any tendency of the lowermost blank to twist as it is  
36 received on a pick-up head 36 etc. So as to facilitate this, the lower ends  
37 of the guides 114, 116 extend slightly below the level of the lowermost  
38 blank when retained by the fingers 4, 6, so as to maintain control of the

1 blank between that level and the pick-up head 36 etc on which the blank  
2 is deposited. As a further aid to control of the stack in the magazine 2, a  
3 pair of inclined spring steel strips 118 (see also Figure 3) carried by fixed  
4 mounting blocks 120 is provided to engage the trailing edges of the  
5 lowermost blanks 3. These help to ensure that only the lowermost blank  
6 3 is released onto each pick-up head 36 etc. Note that it is the trailing  
7 edge of each lowermost blank 3 which is first engaged by a pick-up  
8 head.

9 The suction pads 88 (or suction apertures in the part-cylindrical  
10 pick-up head described hereinbefore) may engage the blanks at  
11 positions related to features of the blanks, e.g. to engage a side flap or  
12 main panel or extend across a fold line, as indicated respectively at 88A,  
13 B and C in Figure 6. Particularly where suction apertures are provided,  
14 these need not be circular and could, for example, be elongated, as  
15 indicated at 88D in Figure 6. It will be understood that the positions of the  
16 pads or apertures 88A-D are indicated in Figure 6 for reference purposes  
17 only and do not indicate a typical or full complement of such positions.

18 Although three pairs of support fingers 4, 6 have been shown in  
19 Figure 6, two pairs may be sufficient. Particularly in this case, however,  
20 the ends of the lowermost blank 3 in the magazine 2 may sag slightly. In  
21 order to prevent premature interference between these ends and the  
22 corresponding outer elements of the support members 44 etc, the  
23 leading ends of the outermost support members may be shortened  
24 slightly, as indicated at 44A in Figure 1.

25 The sequence of pick-up operations is illustrated in Figures 7A to  
26 7G by reference to movement of one pick-up head 38. Figure 7A shows  
27 the pick-up head 38 in a radially oriented position, i.e. in which the  
28 pick-up head is exactly midway between the two adjacent support  
29 members 44 and 46. With the drum assembly 18 rotating in the  
30 counter-clockwise direction as seen in the figures, Figure 7B shows the  
31 pick-up head 38 rotating forward as it approaches the bottom of the  
32 blank stack in the magazine 2. At this point the stack is being supported  
33 by the leading support member 44, as well as the leading and trailing  
34 stack support fingers 4 and 6.

35 As the drum assembly 18 rotates further, towards the position  
36 shown in Figure 7C, it will be seen that the shape of the cam track 54 at  
37 this rotational position is such that the pick-up head 38 begins to rotate  
38 in the opposite (i.e. reverse) direction, as it engages with the underside



1 of the low rmost blank in th magazine 2, and at this point vacuum will  
2 be supplied to the pick-up head, while the trailing stack support fingers 6  
3 are disengaged from the corresponding edge of the stack, under control  
4 of the cam mechanism 16.

5 In the position shown in Figure 7D the pick-up head has rotated  
6 further in the reverse direction, and peeling of the lowermost bank  
7 continues, so that the removal of the trailing edge of the lowermost blank  
8 from the stack enables the trailing support fingers 6 to be moved back  
9 into engagement with the remaining blanks. At the same time, the trailing  
10 support member 46 begins to engage under the central part of the  
11 remainder of the stack, while the leading support finger is retracted to  
12 release the leading edge of the current blank on to the pick-up head 38.  
13 Note that conveyed blanks are not shown in Figure 7.

14 In the position of Figure 7E the peeling of the current blank is  
15 complete, and the pick-up head 38 begins to rotate forwards again,  
16 towards the radial position, while the stack is supported by the guide 46,  
17 and subsequently, in the position shown in Figure 7F, the leading  
18 support fingers 4 are re-engaged with the stack, while the pick-up head  
19 is approaching the point of delivery of the blank onto the discharge  
20 conveyor 52 (Figure 1). Finally, in the position shown in Figure 7G, the  
21 pick-up head 38 has reached the radial position, and the blank is  
22 released onto the discharge conveyor 52.

23 It will be understood that, by providing the suction manifold 95 in  
24 two parts, it is possible to provide suction separately to these parts and  
25 hence, when required, suction could be turned off in the region of the  
26 magazine 2, so that no further blanks 3 are picked up, while blanks  
27 already picked up are conveyed to the conveyor 52. This may be useful  
28 in providing an ordered shut-down of the apparatus.

29 The fingers 4, 6 are pivoted above the level of the lowermost blank  
30 3 in the stack 2 such that the motion of the supporting parts of the  
31 fingers towards and away from their supporting positions are  
32 substantially horizontal. As a consequence, it is important that the  
33 respective edges of the next-to-lowermost blank should not fall  
34 significantly after the lowermost blank has been released but before the  
35 fingers 4, 6 return from their retracted positions, otherwise the fingers will  
36 be unable to engage below this blank and may even damage it on their  
37 return. The support members 42 etc assist in maintaining the position of  
38 the next-to-lowermost blank. Maintaining its position can be made l ss

critical if the support fingers are arranged to move upwards during the final stag of their return to the stack support positions. One way of achieving this, at least in part, is to shorten the fingers 4, 6 and/or lower their pivot axes. Alternatively, fingers, which need not necessarily be pivoted, could be moved on a closed loop path on which they are withdrawn in a substantially horizontal direction but returned on a path which has a final upward portion, so that if a blank has fallen slightly the fingers will engage under and lift it. A cam-controlled pivoted link mechanism could achieve this motion path for the fingers.

Claims

1. Apparatus for handling blanks comprising a magazine for receiving a stack of blanks and including means for supporting the stack, endless conveyor means for receiving successive lowermost blanks from the stack, said conveyor means including at least one blank pick-up device arranged to receive and convey blanks from the stack, and support means carried by the endless conveyor means for at least partly supporting the stack between pick-up operations of said pick-up device.

2. Apparatus as claimed in claim 1, including means for driving the endless conveyor means continuously.

3. Apparatus as claimed in claim 1 or claim 2, wherein the endless conveyor means carries a plurality of spaced pick-up devices between which are arranged a plurality of spaced support members.

4. Apparatus as claimed in claim 3, wherein the endless conveyor means comprises a rotary member rotatable about an axis which is parallel to a plane in which the lowermost blank in the stack extends.

5. Apparatus as claimed in claim 4, wherein said support members include arcuate surfaces at least approximately co-axial with the axis of said rotary member and arranged to engage successive lowermost blanks in the stack.

6. Apparatus as claimed in claim 4 or claim 5, wherein the support members and pick-up devices are so disposed as to allow a support member to engage the stack during a pick-up operation.

7. Apparatus as claimed in any of claims 4 to 6, wherein said support members include laterally-spaced regions having leading edges which are spaced in the direction of conveyance, so as to accommodate different levels of parts of the lowermost blank corresponding to said regions.

8. Apparatus as claimed in any of claims 4 to 7, wherein said

1 support members comprise a plurality of laterally-spaced elements  
2 contacting the blanks at laterally-spaced regions.

3  
4 9. Apparatus as claimed in any of claims 4 to 8, wherein each  
5 pick-up device includes an arm pivoted about an axis parallel to said  
6 axis, including control means for controlling the angular position of the  
7 arm as said rotary member rotates about said axis.

8  
9 10. Apparatus for handling blanks comprising a magazine for  
10 receiving a stack of blanks and including means for supporting the stack,  
11 endless conveyor means for receiving successive lowermost blanks from  
12 the stack, said conveyor means including at least one blank pick-up  
13 device arranged to receive and convey blanks from the stack, wherein  
14 said endless conveyor means comprises a rotary member rotatable  
15 about an axis and said pick-up device includes an arm pivoted about an  
16 axis parallel to said axis, and control means for controlling the angular  
17 position of the arm as said rotary member rotates about said axis.

18  
19 11. Apparatus as claimed in claim 9 or claim 10, wherein said  
20 control means is arranged to reciprocate each arm about said pivot axis  
21 during rotation of said rotary member.

22  
23 12. Apparatus as claimed in any of claims 9 to 11, wherein said  
24 control means is arranged to pivot each arm in the region of said  
25 magazine from a forward position, in which the arm is angularly in  
26 advance of a radial position relative to the axis of said rotary member, to  
27 a rearward position, in which said arm is angularly retarded from a radial  
28 position relative to said axis.

29  
30 13. Apparatus as claimed in any of claims 9 to 12, wherein  
31 each pick-up device includes a peripheral arcuate surface for receiving a  
32 blank, said control means being arranged so that each arm is moved in  
33 the region of said magazine so that said arcuate surface performs a  
34 rolling action relative to the stack to receive a lowermost blank.

35  
36 14. Apparatus as claimed in any of claims 9 to 13, wherein the  
37 control means comprises a follower carried by each device and a fixed  
38 cam track extending around the axis of said rotary member.

1           15. Apparatus as claimed in claim 14, where in each follower is  
2 connected to each arm by means including a pivoted link arrangement.

3  
4           16. Apparatus as claimed in any preceding claim, wherein said  
5 at least one blank pick-up device includes means defining a peripheral  
6 arcuate surface, including a plurality of spaced means each defining at  
7 least one suction aperture and at least one intermediate region for  
8 supporting a blank.

9  
10          17. Apparatus as claimed in claim 16, wherein said spaced  
11 regions are arranged in a predetermined pattern disposed so as to  
12 correspond with predetermined features of a blank.

13  
14          18. Apparatus as claimed in claim 16 or claim 17, including port  
15 means movable with said endless conveyor means and arranged to  
16 cooperate with at least one stationary suction manifold so as to supply  
17 suction to said suction apertures during a predetermined portion of the  
18 path of said pick-up device.

19  
20          19. Apparatus as claimed in claim 18, wherein said suction  
21 manifold includes a first region at a position corresponding to movement  
22 of the pick-up device past said magazine, and a second region  
23 downstream of said first region, and means for selectively applying  
24 suction to said suction manifold, whereby suction may be supplied to  
25 said first and second regions or to said second region alone.

26  
27          20. Apparatus as claimed in any preceding claim, wherein the  
28 means for supporting the stack at the magazine comprises means for  
29 supporting opposed edges of the lowermost blank of the stack.

30  
31          21. Apparatus as claimed in claim 20, wherein said supporting  
32 means comprises retractable elements respectively at the leading and  
33 trailing edges of a lowermost blank, and means for sequentially  
34 retracting said elements in synchronism with movement of a pick-up  
35 device to receive said lowermost blank.

36  
37          22. Apparatus for handling blanks comprising a magazine for  
38 receiving a stack of blanks and including means for supporting the stack,

1 endless conveyor means for receiving successive lowermost blanks from  
2 the stack, said conveyor means including at least one blank pick-up  
3 device arranged to receive and convey blanks from the stack, said  
4 supporting means including means for supporting opposed edges of the  
5 lowermost blank of the stack including retractable elements respectively  
6 at the leading and trailing edges of a lowermost blank, and means for  
7 sequentially retracting said elements in synchronism with movement of  
8 the pick-up device to receive said lowermost blank.

9  
10 23. Apparatus as claimed in claim 21 or claim 22, wherein said  
11 elements comprise pivotally mounted support fingers.

12  
13 24. Apparatus as claimed in any of claims 21 to 23, wherein  
14 said retractable elements are connected to cam operated pivoted link  
15 mechanisms to produce said sequential retraction of said elements.

16  
17 25. Apparatus as claimed in preceding claim, wherein the  
18 supporting means includes a resilient device arranged to engage the  
19 trailing edge of the lowermost blank in the stack, said device being  
20 disposed to release the lowermost blank but retain the next-to-lowermost  
21 blank on each operation of said pick-up device.

22  
23 26. Apparatus as claimed in claim 25, wherein said resilient  
24 device includes at least one spring strip having a free edge engaging the  
25 trailing edge of the lowermost blank in the stack.

26  
27 27. Apparatus as claimed in any preceding claim, including  
28 downwardly-extending guide means providing lateral support for the  
29 stack in said magazine, said guide means including first and second  
30 spaced elements located at diagonally opposed regions of the magazine  
31 and adapted to inhibit twisting of a blank during transfer to a pick-up  
32 device.

33  
34 28. Apparatus as claimed in claim 26, wherein said elements  
35 extend slightly below the level of the supporting means.

Fig.1.

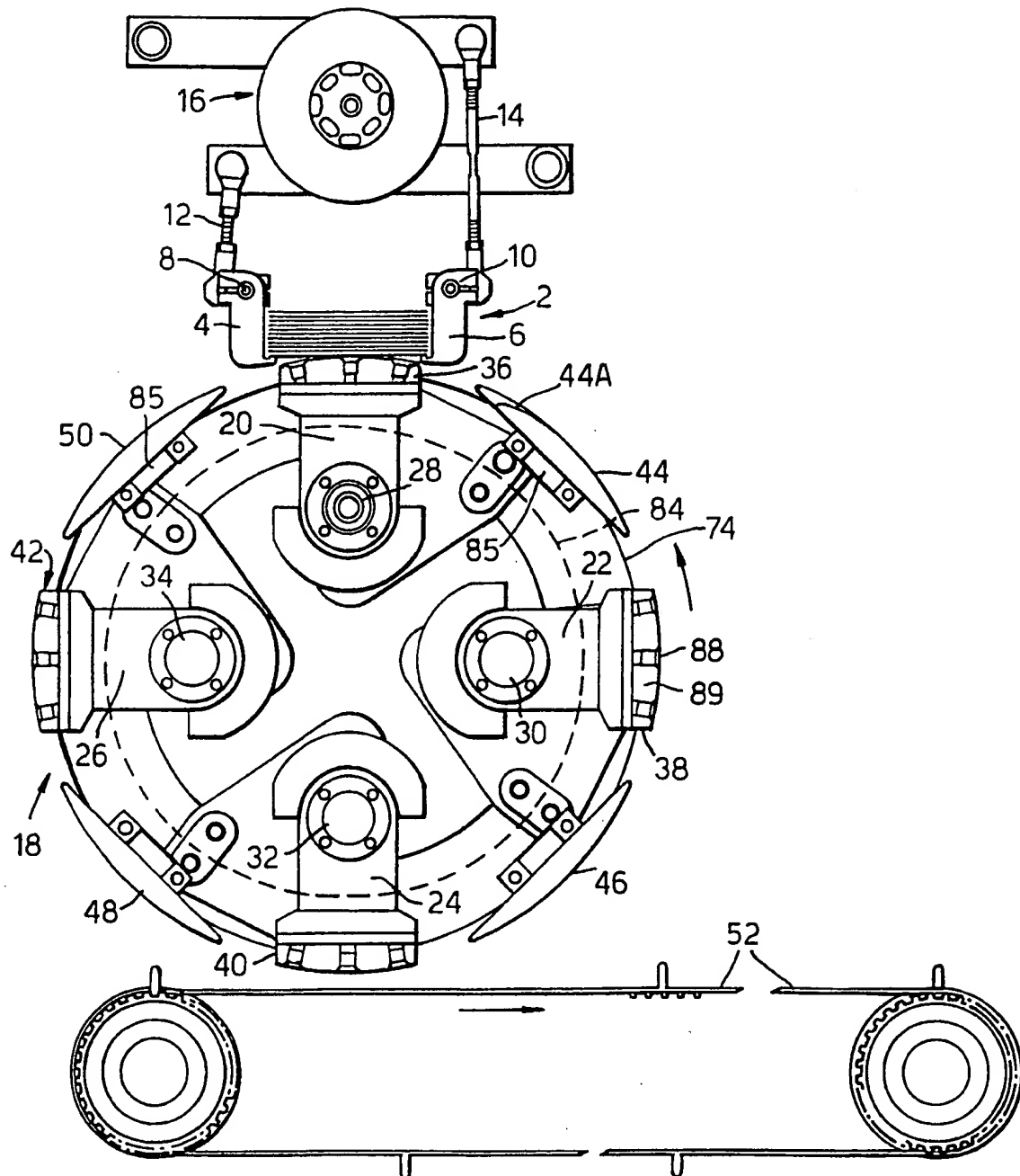
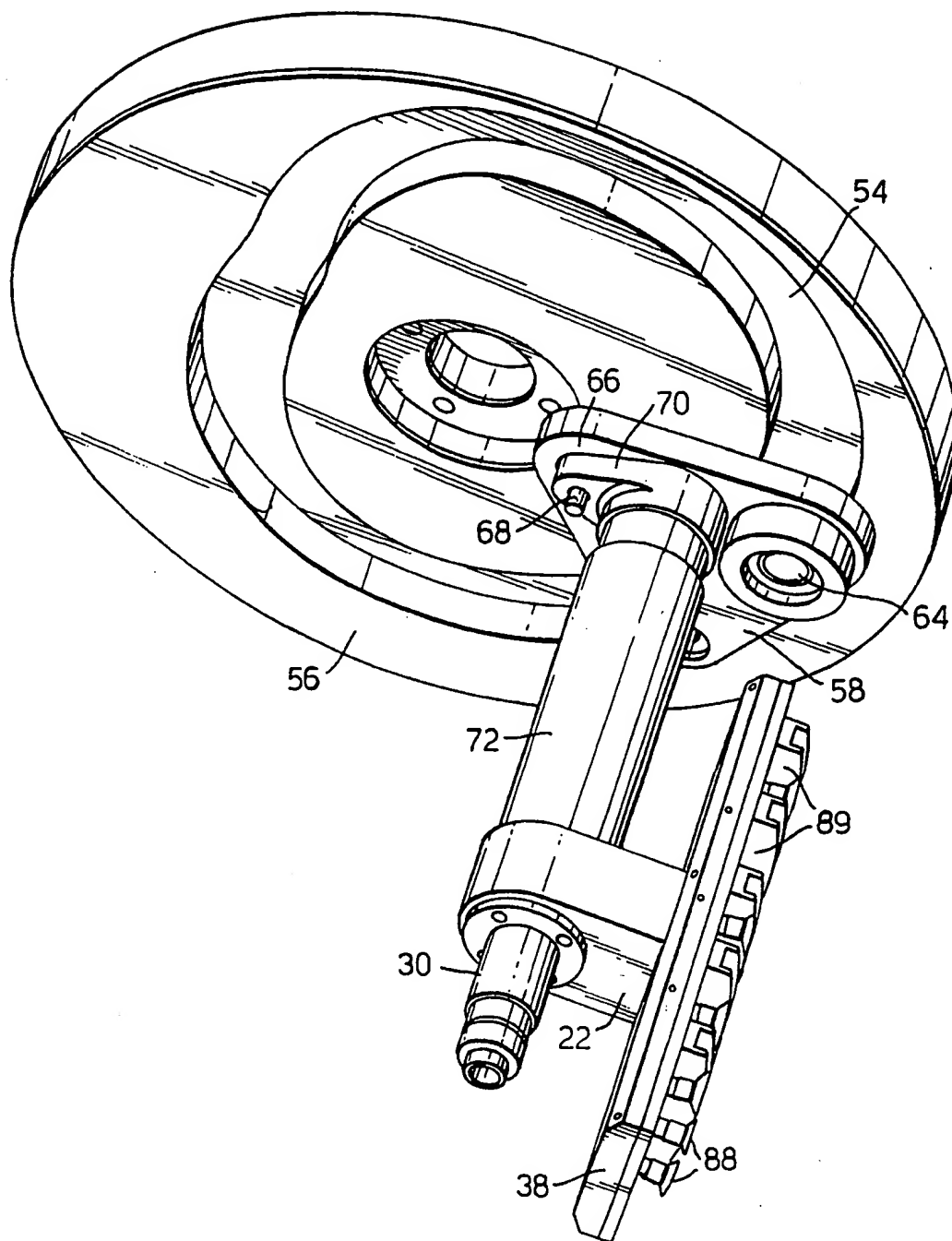


Fig.2.





3/13

Fig.3.

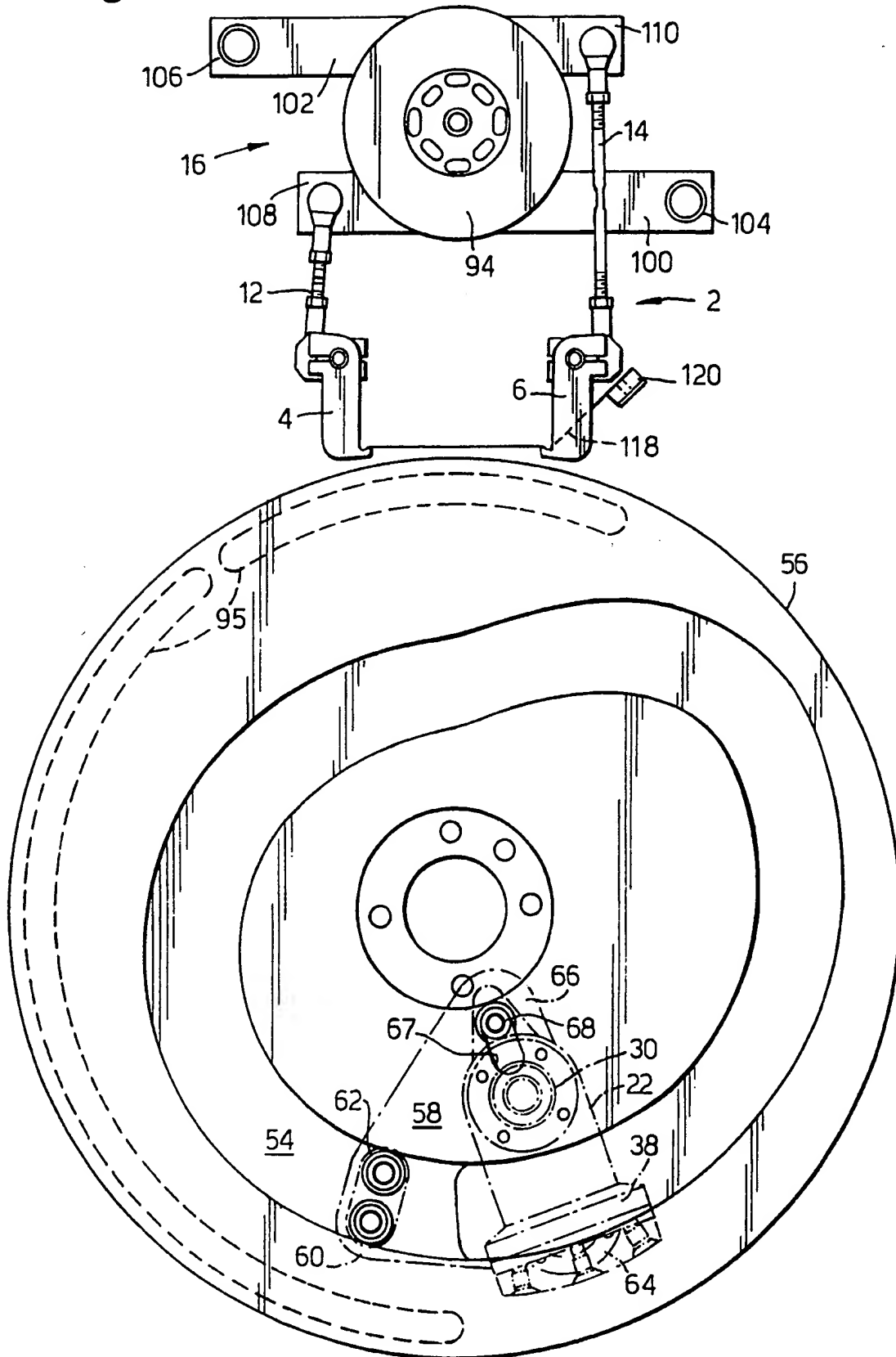


Fig.4.

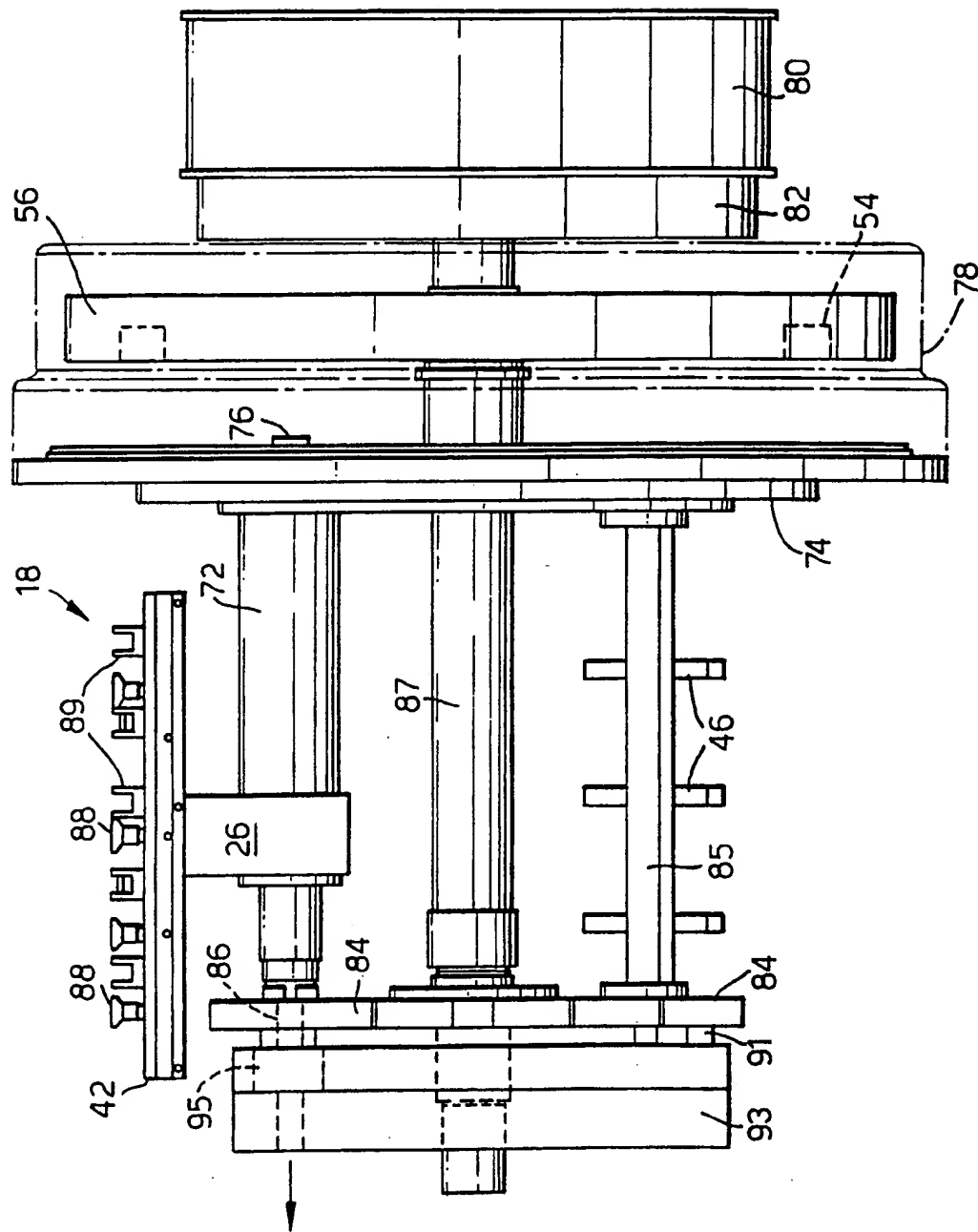
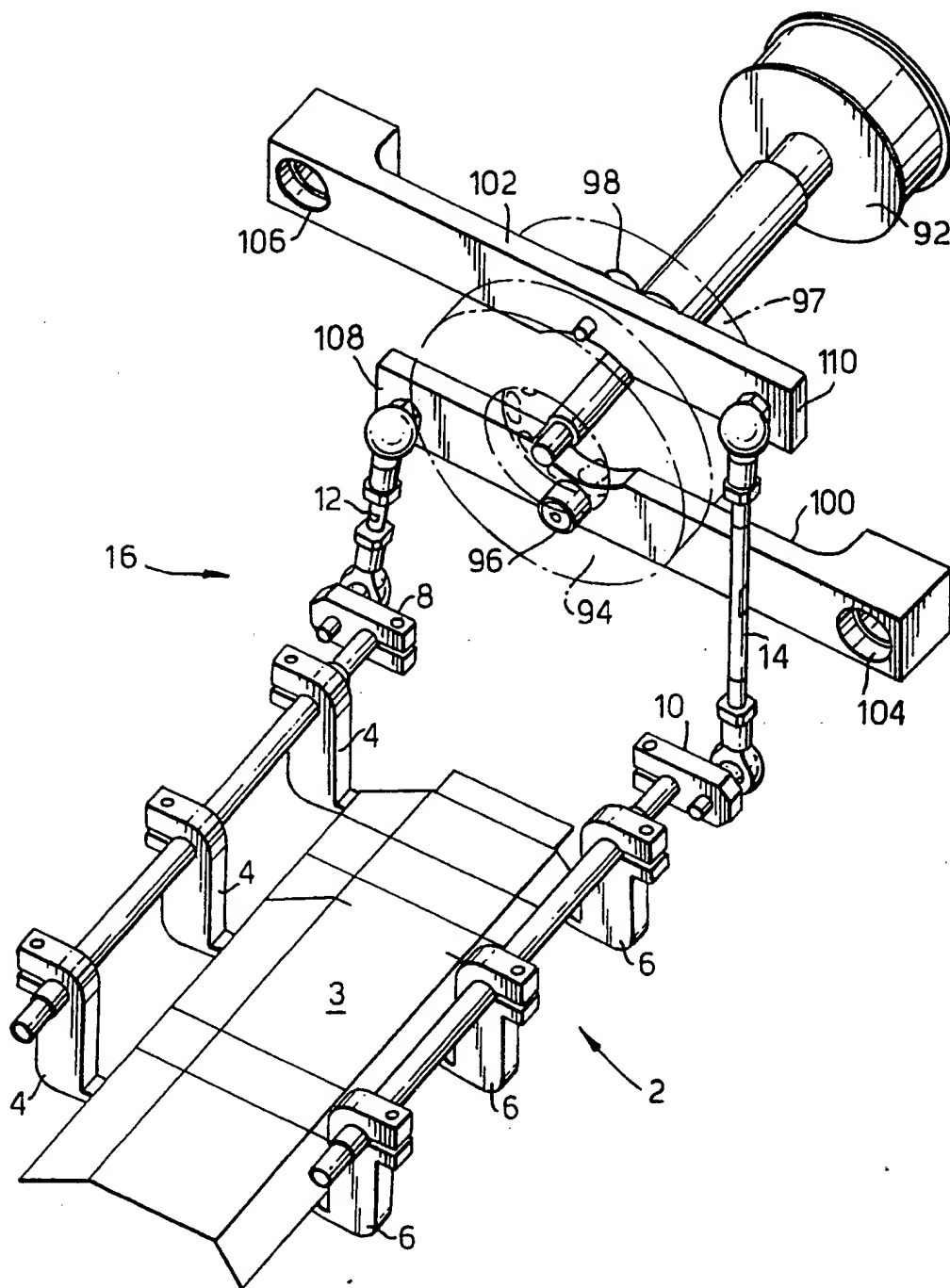


Fig.5.



6/13

Fig.6.

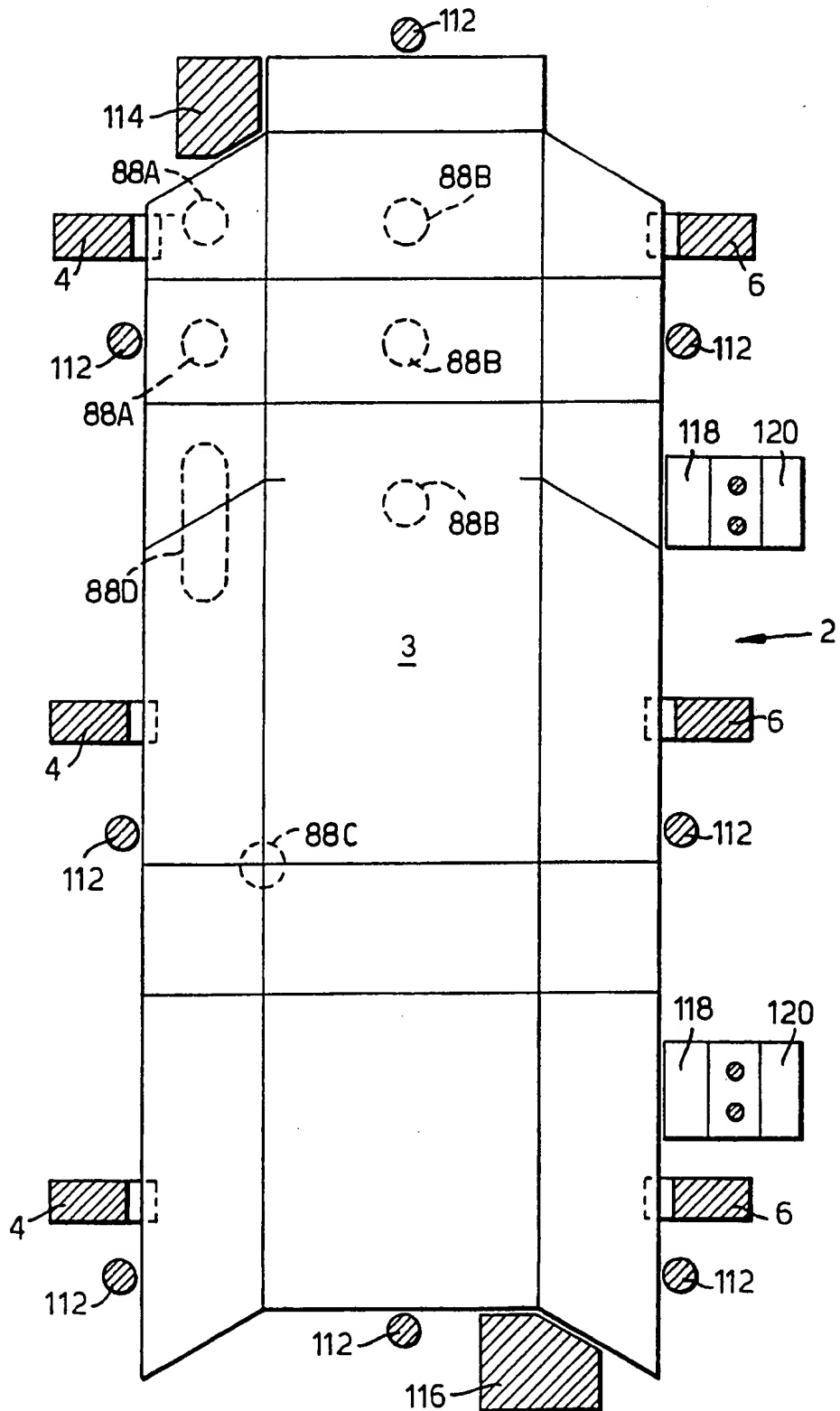


Fig.7A.

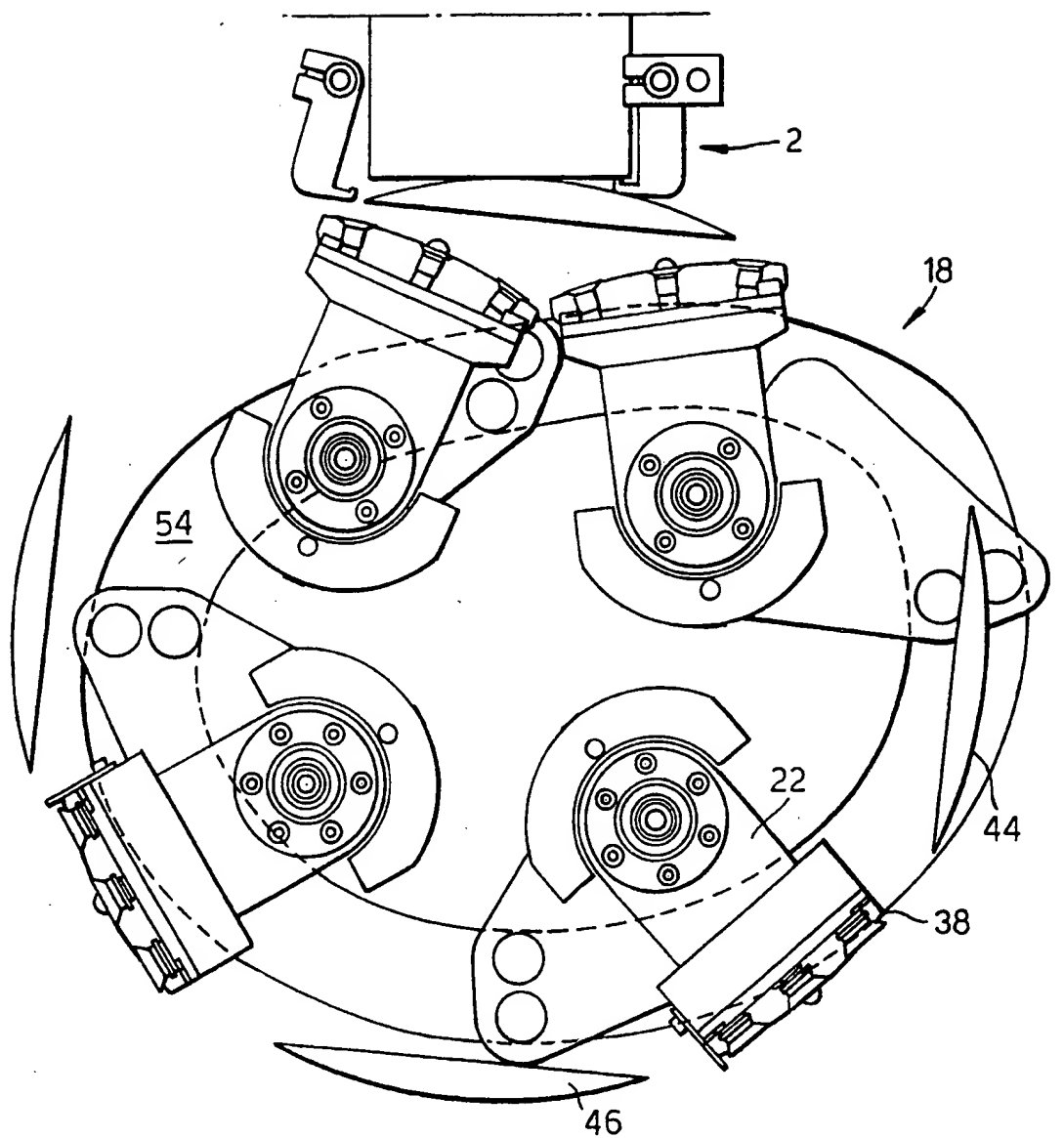
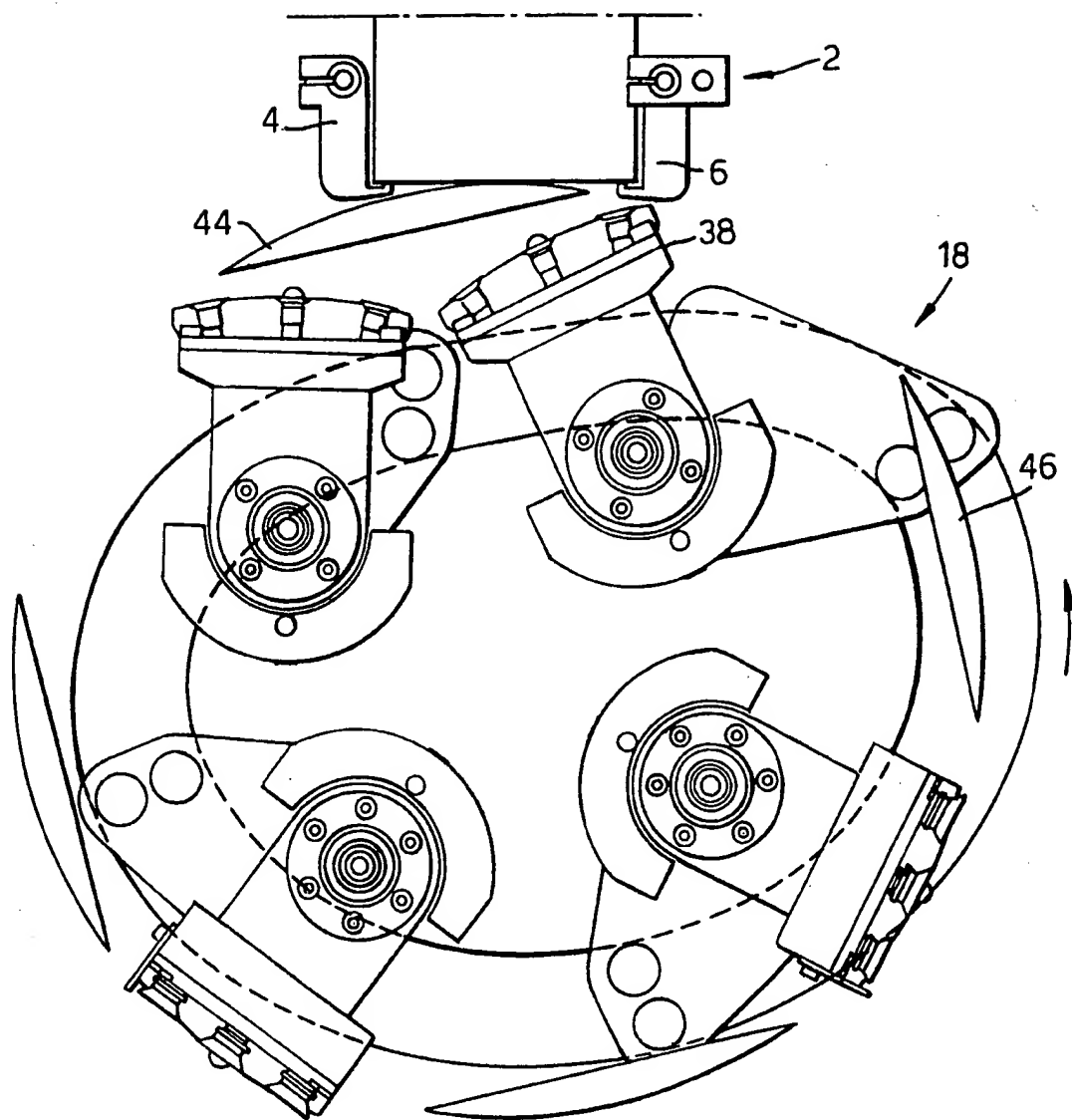


Fig.7B.



9/13

Fig.7C.

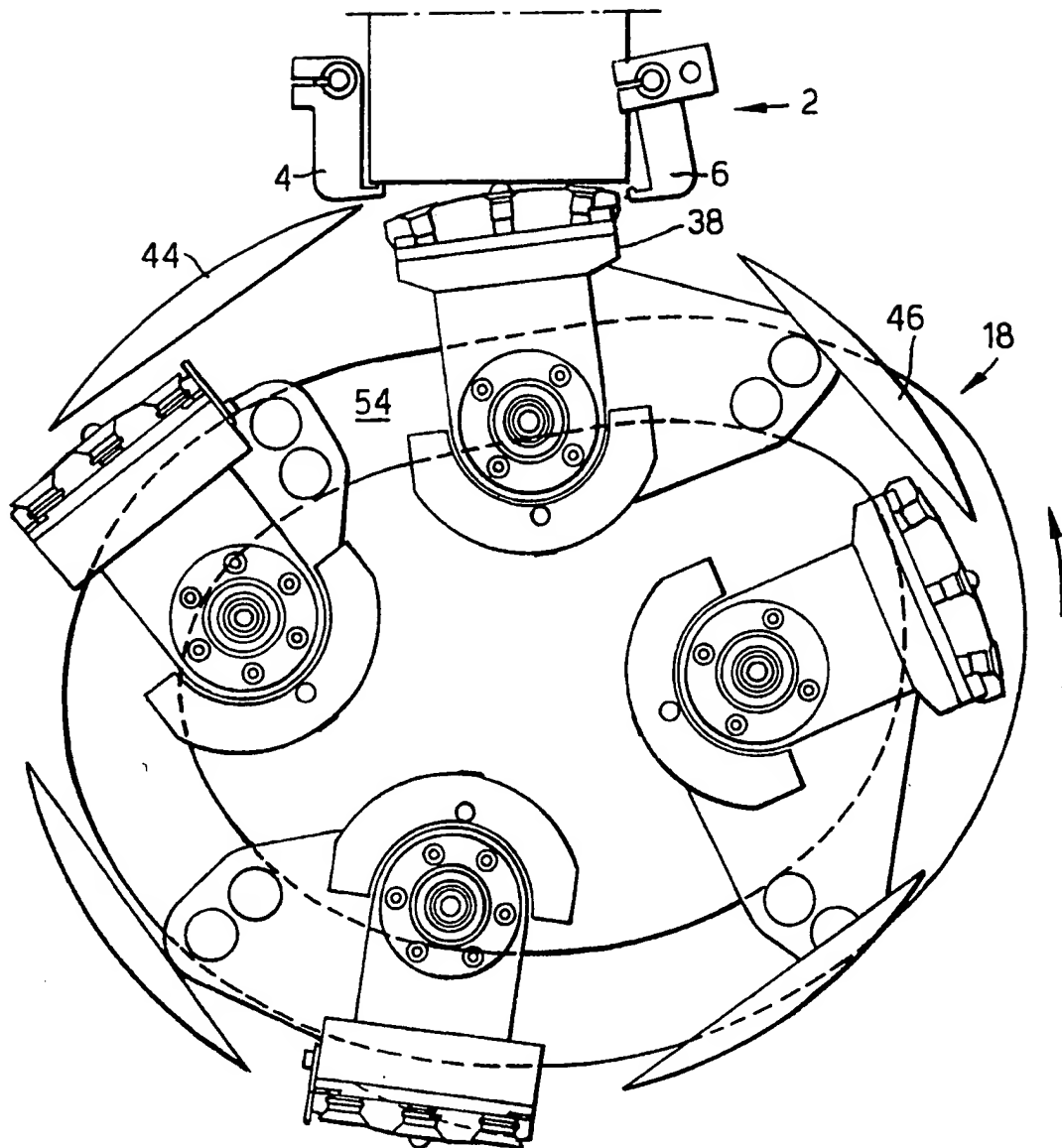






Fig.7E.

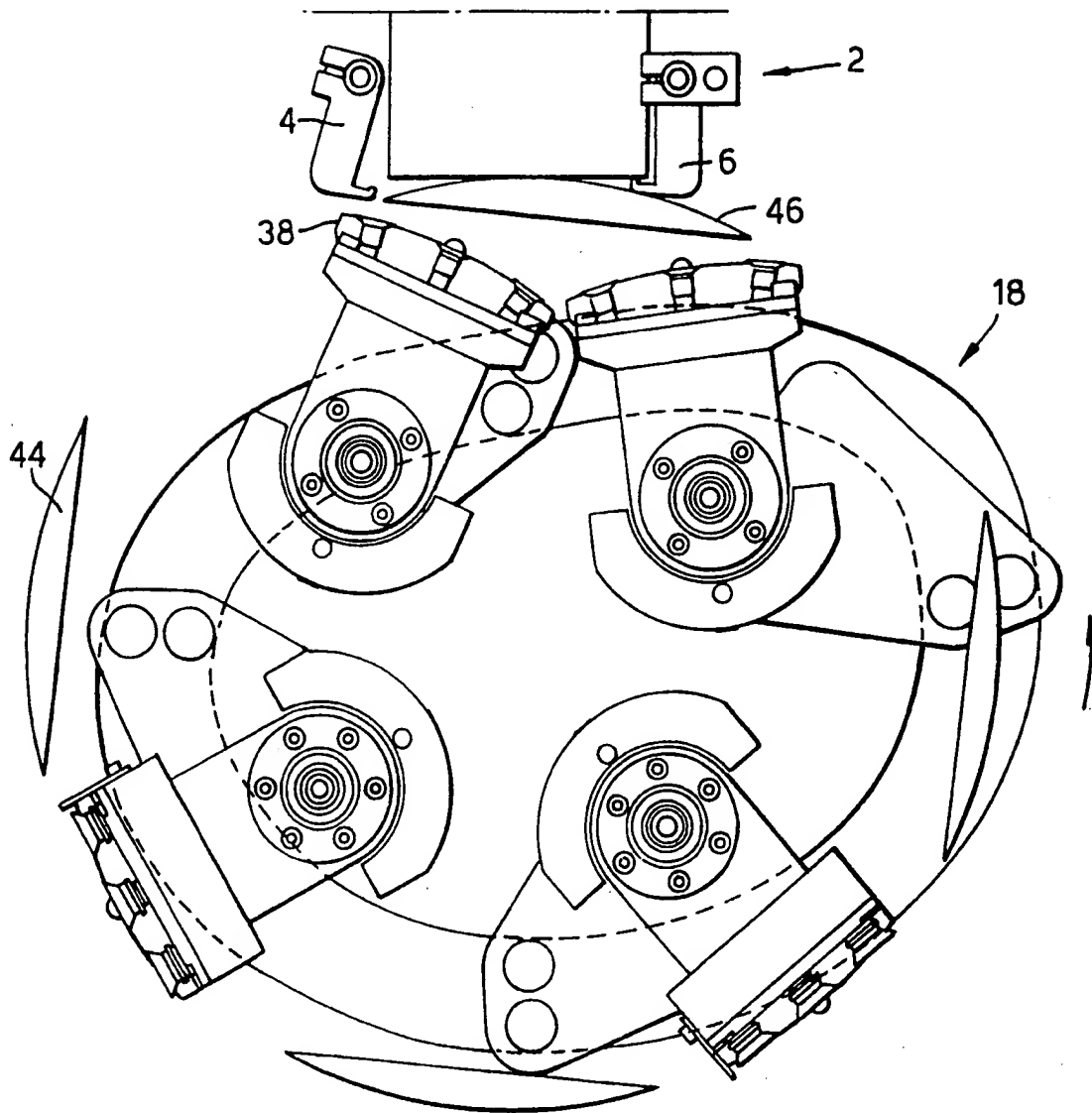


Fig.7F.

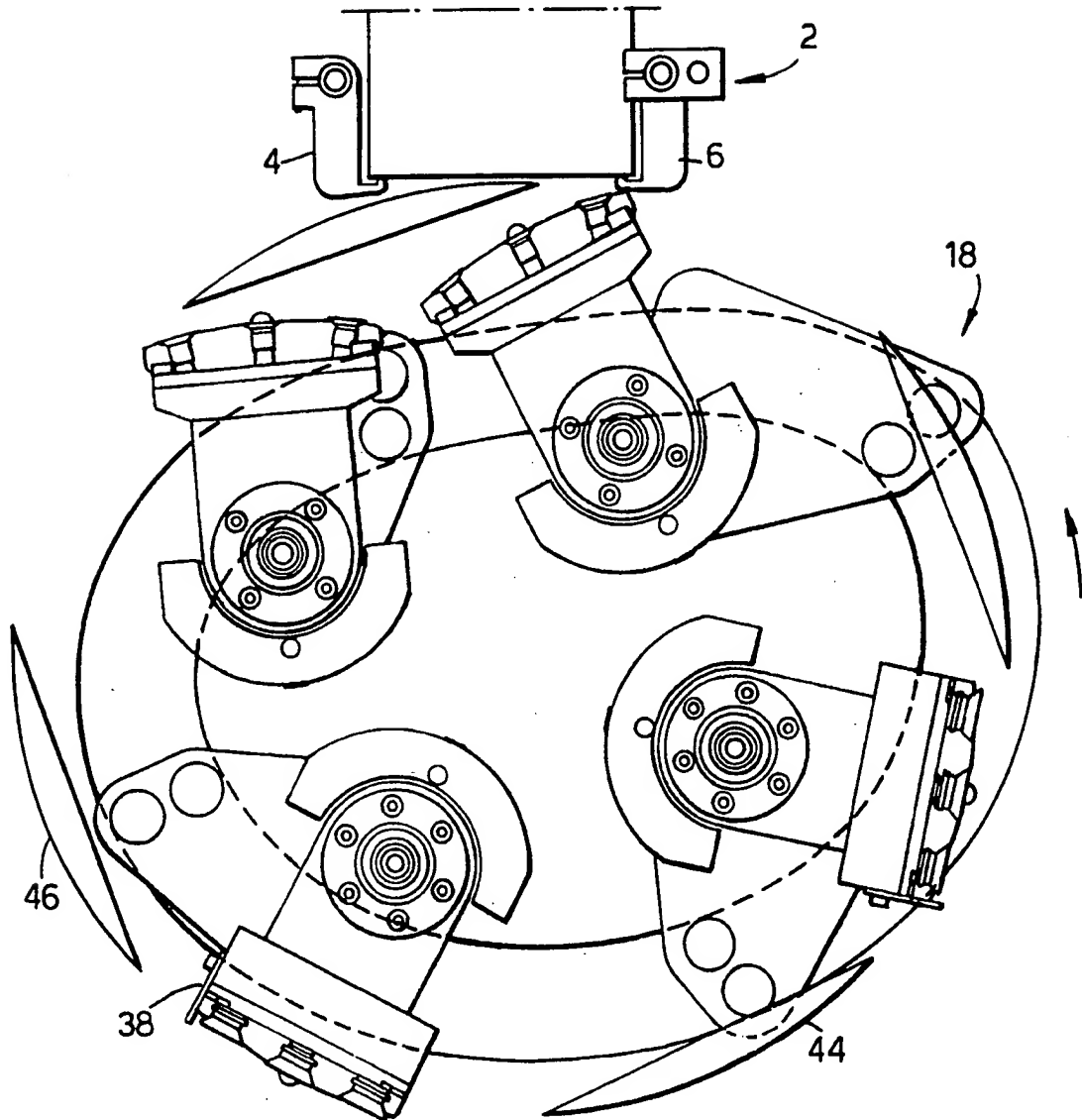
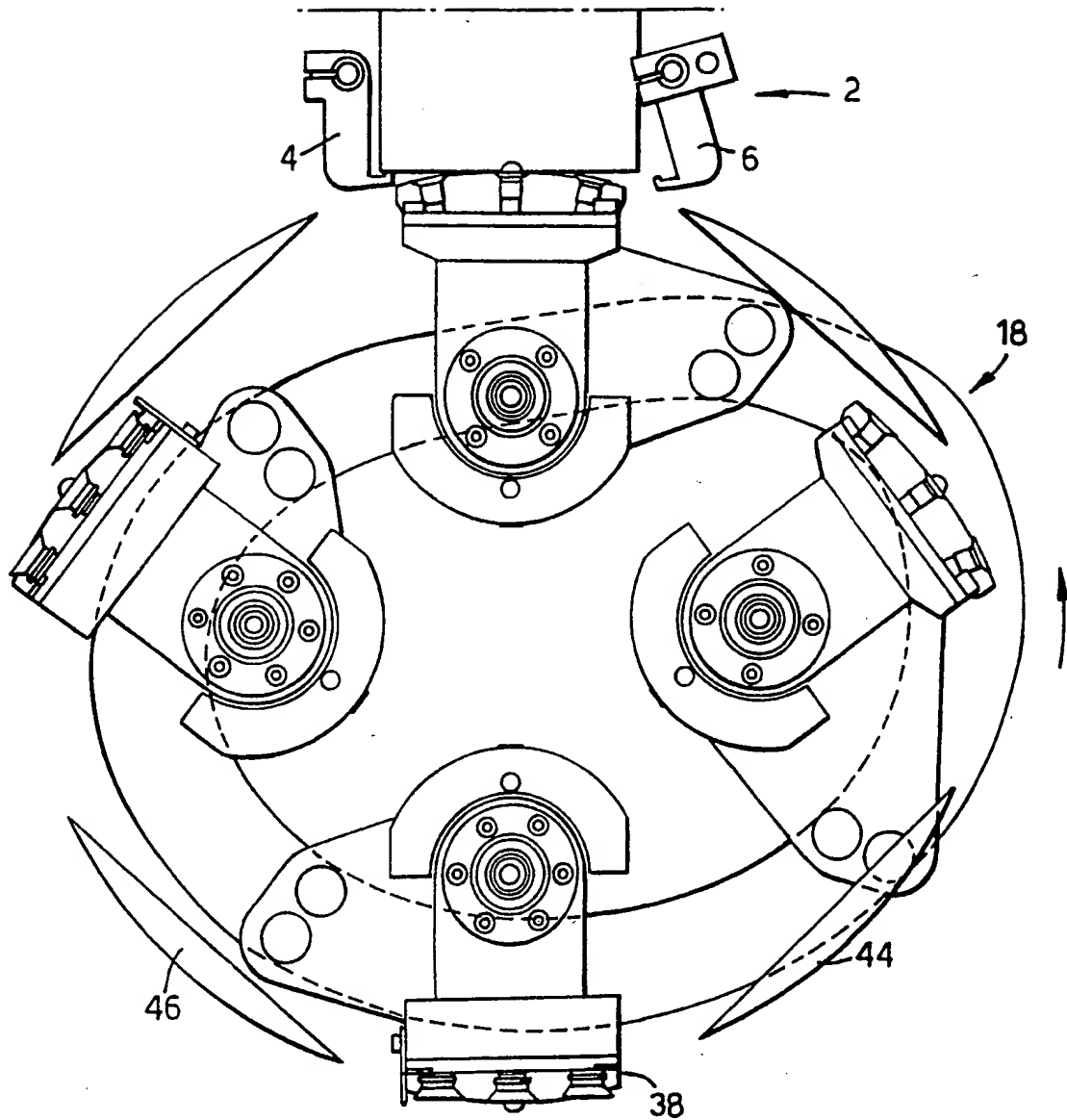


Fig.7G.



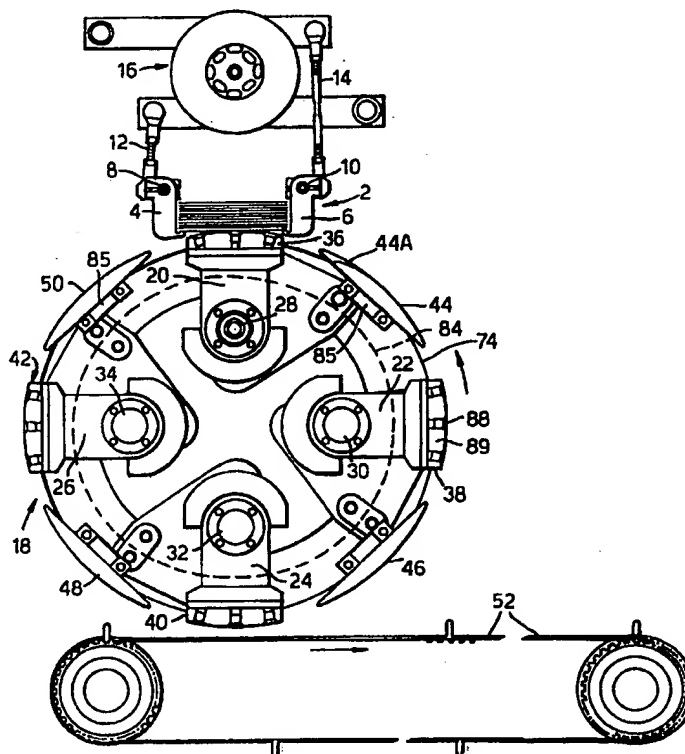


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT).

<b>(51) International Patent Classification <sup>6</sup> :</b>  <b>B65H 3/42, 3/08, 1/06</b>	<b>A3</b>	<b>(11) International Publication Number:</b> <b>WO 98/42604</b>  <b>(43) International Publication Date:</b> 1 October 1998 (01.10.98)
<b>(21) International Application Number:</b> PCT/GB98/00932  <b>(22) International Filing Date:</b> 26 March 1998 (26.03.98)  <b>(30) Priority Data:</b> 9706261.6                      26 March 1997 (26.03.97)                      GB  <b>(71) Applicant (for all designated States except US):</b> MOLINS PLC [GB/GB]; 11 Tanners Drive, Blakelands, Milton Keynes MK14 5LU (GB).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> BAILEY, Thomas, William [GB/GB]; 13 Westwood Way, Westwood Business Park, Coventry CV4 8HS (GB). CLEALL, Andrew, John [GB/GB]; 13 Westwood Way, Westwood Business Park, Coventry CV4 8HS (GB). HILL, Brian [GB/GB]; 13 Westwood Way, Westwood Business Park, Coventry CV4 8HS (GB).  <b>(74) Agent:</b> WEBB, John, Charles; Molins plc, Group Patent Dept., Haw Lane, Saunderton, High Wycombe, Bucks HP14 4JE (GB).	<b>(81) Designated States:</b> CN, JP, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims</i> <i>and to be republished in the event of the receipt of amendments.</i>  <b>(88) Date of publication of the international search report:</b> 21 January 1999 (21.01.99)	

**(54) Title:** BLANK HANDLING APPARATUS**(57) Abstract**

Blank feeding apparatus, particularly in a hinged-lid cigarette packing machine, includes rotary blank pick-up means (36-42), and support means (44-50), rotatable with the pick-up means, for engaging and supporting the base of a blank stack in a magazine (2) between each pick-up operation. The pick-up means (36-42) may each comprise a pivotable arm (20-24), movable as it rotates by means of a pivoted follower member (60, 62) engaging a fixed cam track (54). The blanks may be retained in the stack in the magazine (2) by pivotally-mounted support fingers (4, 6) which are successively retracted to release a blank as the pick-up means (36-42) passes.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakhstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 98/00932

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 B65H3/42 B65H3/08 B65H1/06

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 B65H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 405 107 A (GRAPHIA-HOLDING AG) 2 January 1991 see the whole document ---	1-4,6,9, 16,18
X	DE 21 10 963 A (VEB POLYGRAPH) 24 February 1972 see the whole document ---	1-4,6,8
X	EP 0 267 365 A (AM INTERNATIONAL INC.) 18 May 1988 see the whole document -----	1-4,6,8, 9,11,14

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

14 July 1998

Date of mailing of the international search report

10.11.98

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016--

Authorized officer

RAVEN, P

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB 98/00932

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-9, 11-21, 23-28

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: 1-9, 11-21, 23-28.

Apparatus for handling blanks including continuously driven endless conveyor means comprising a rotary member rotatable about an axis, on which spaced support means, formed with arcuate surfaces co-axial with said axis, are carried for support of the lowermost blank in a stack.

2. Claims: 10-21, 23-28.

Apparatus for handling blanks including pick-up means, in the form of pivotable arms, mounted on an endless conveyor in the form of a rotary member, wherein control means are provided to reciprocate the pick-up arms about an axis parallel to the axis of the rotary member during rotation of said member.

3. Claims: 22-28.

Apparatus for handling blanks including retractable elements for the support of the lowermost blank in the stack.



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/00932

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 405107 A	02-01-1991	CH 679478 A	28-02-1992
		DE 59004864 D	14-04-1994
		JP 3031142 A	08-02-1991
		US 5080341 A	14-01-1992
-----			
DE 2110963 A	24-02-1972	NONE	
-----			
EP 267365 A	18-05-1988	US 4901996 A	20-02-1990
-----			